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H1X X5E

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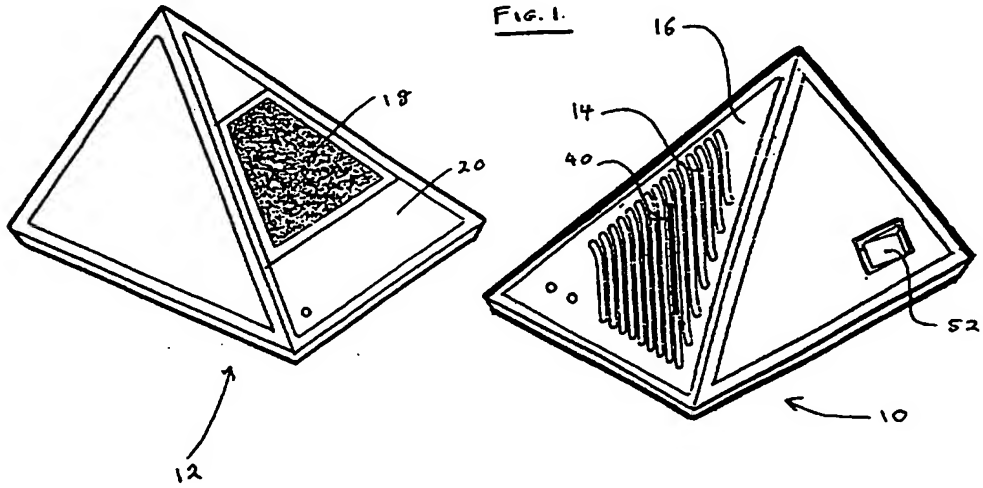
GB 2036951 A GB 2021757 A

(58) Field of Search
UK CL (Edition N) F4V VFC
INT CL[6] F24F
Online databases:WPI

(54) Air purifier

(57) An air purifying device comprises an ioniser unit 10 and a dust collector unit 12. The ionizer unit 10 includes a two speed fan drawing air into the unit through a filter over an ultra-violet tube emitter and then blowing air out of the unit over a negative high voltage direct current carbon fibre element 40. The dust collector unit 12 includes an electrically conductive foam 18 electrically connected to a positive high voltage direct current source whereby negatively charged dust particles will be attracted to the foam.

Fig. 1.



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

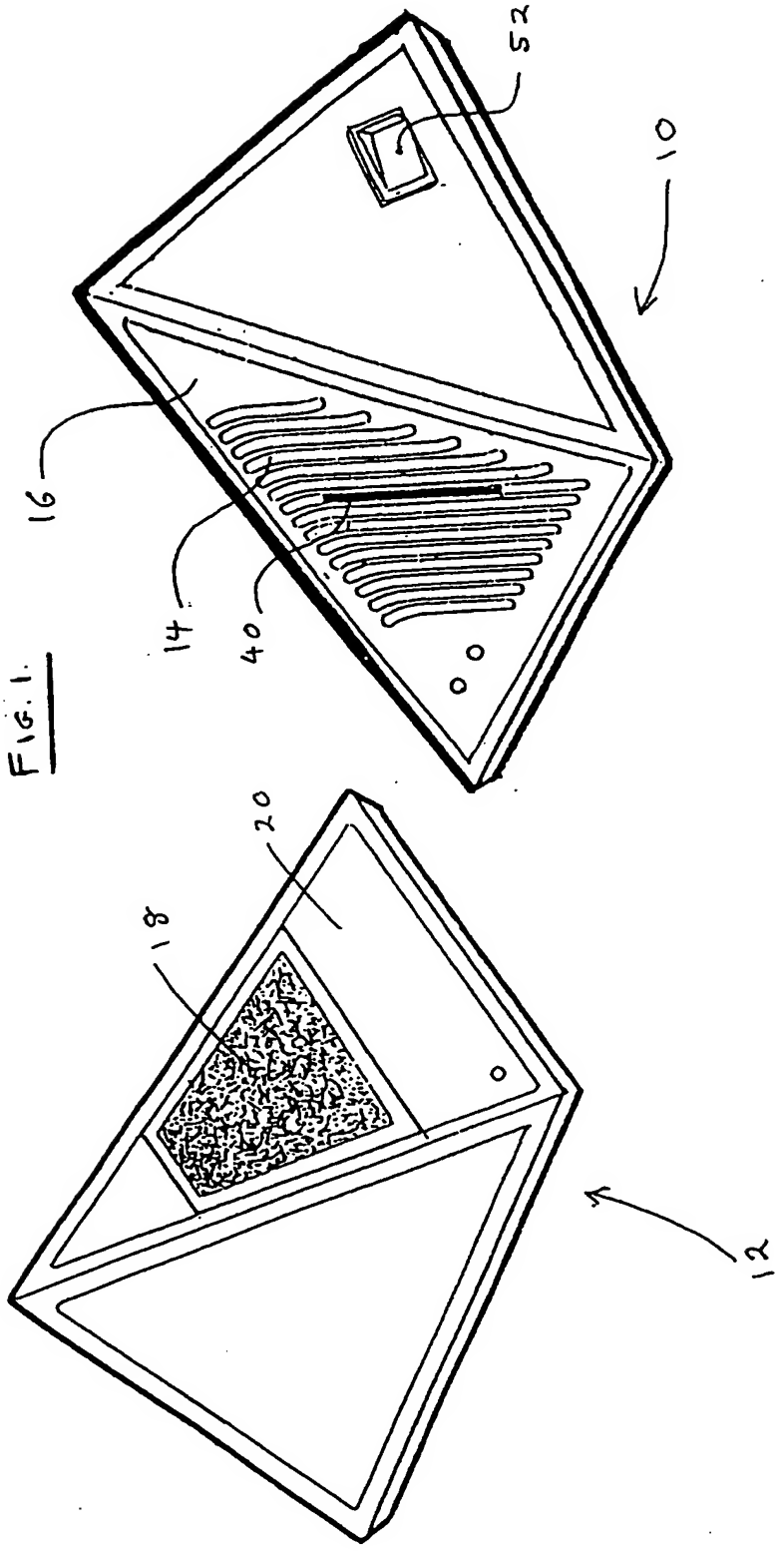


FIG. 1.

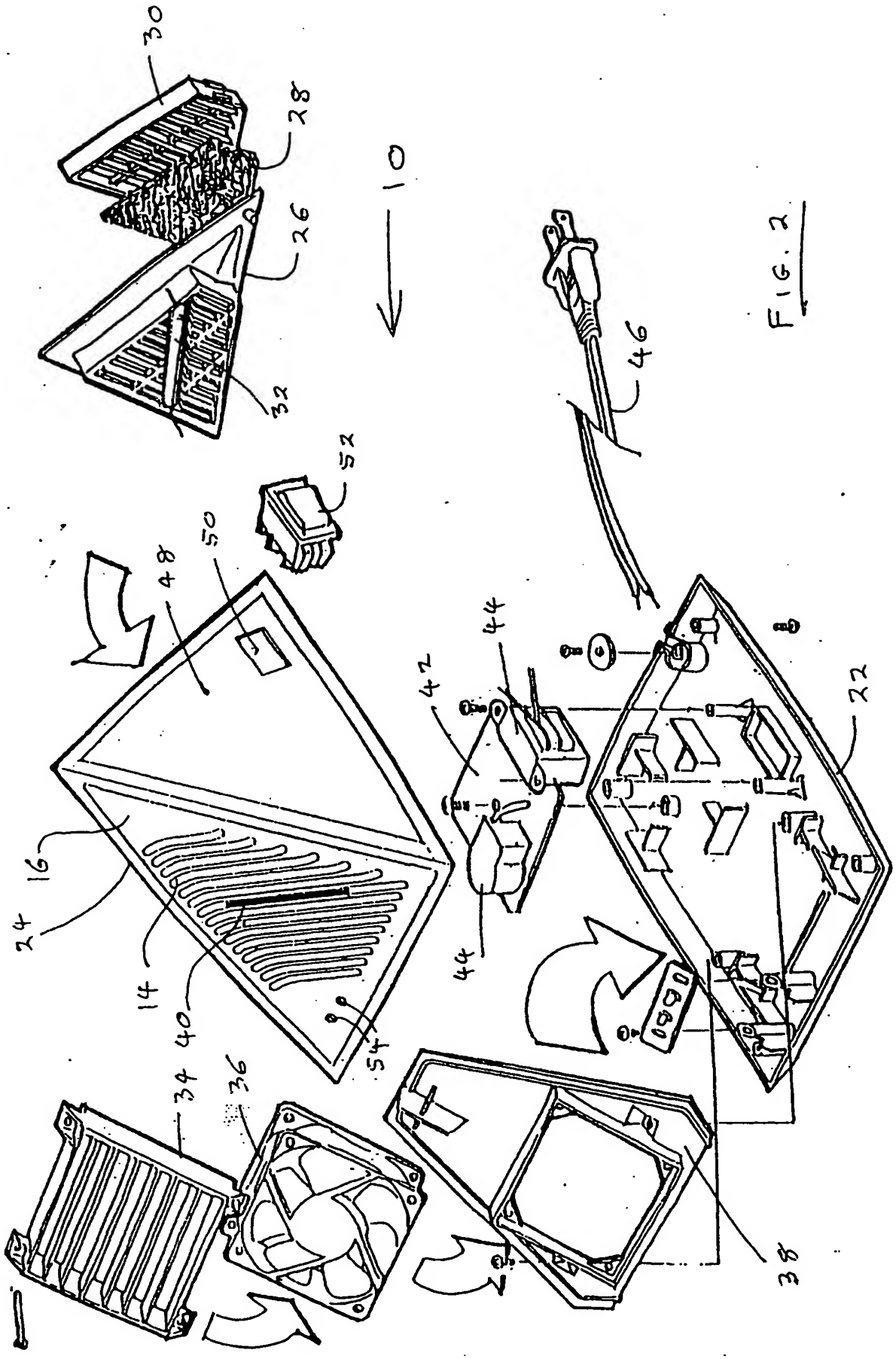
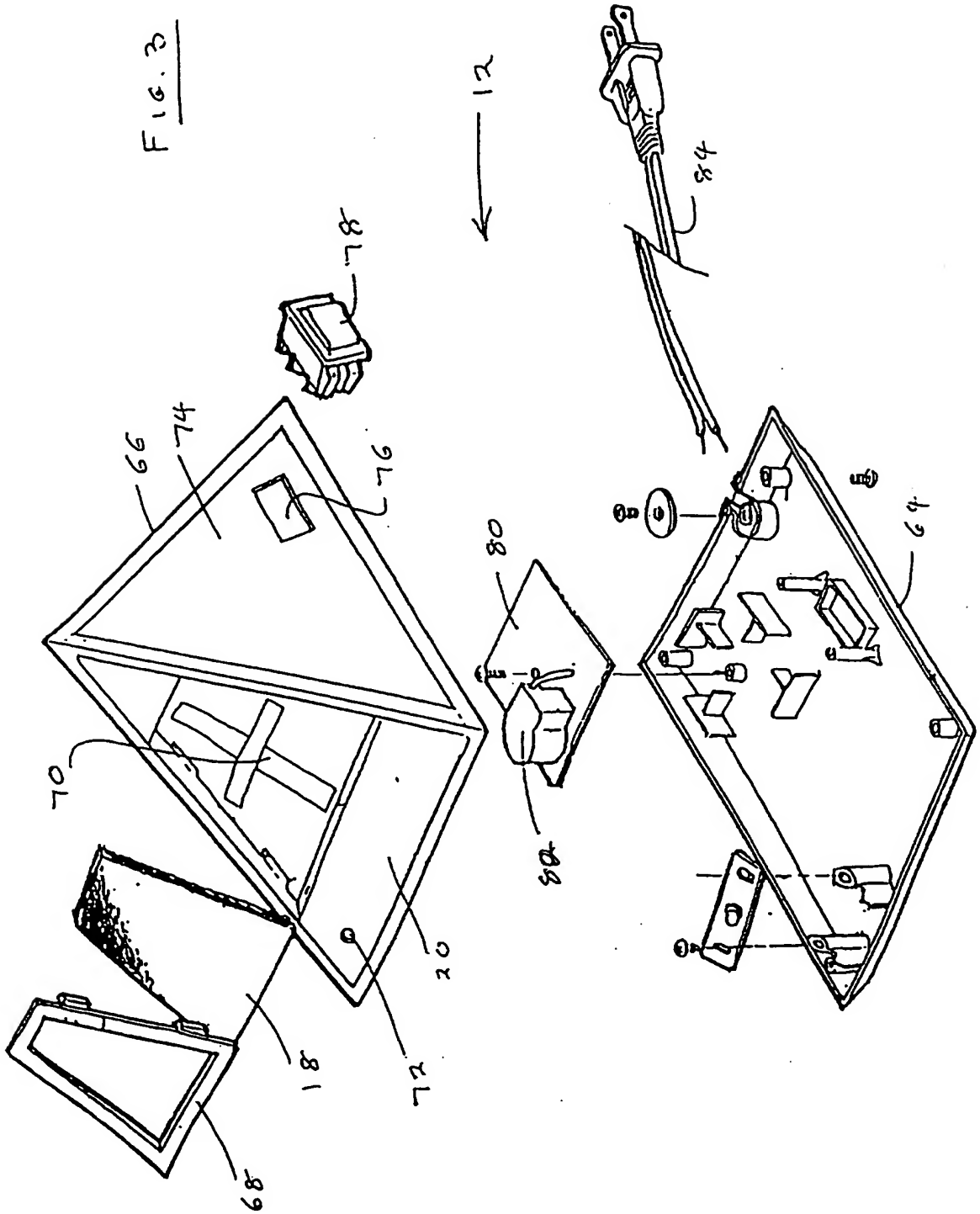


FIG. 2

FIG. 3



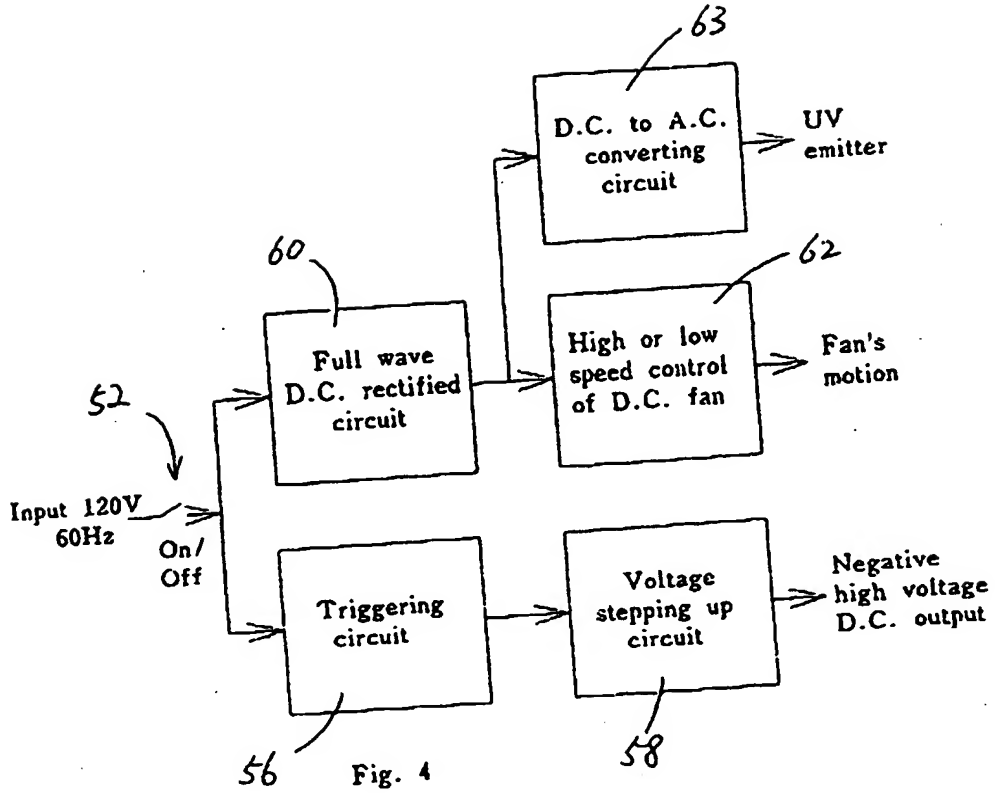

63
D.C. to A.C. converting circuit
UV emitter
60
62
Full wave D.C. rectified circuit
High or low speed control of D.C. fan
Fan's motion
52
Input 120V 60Hz
On/ Off
Triggering circuit
Voltage stepping up circuit
Negative high voltage D.C. output
56
58

Fig. 4

FIG. 4.

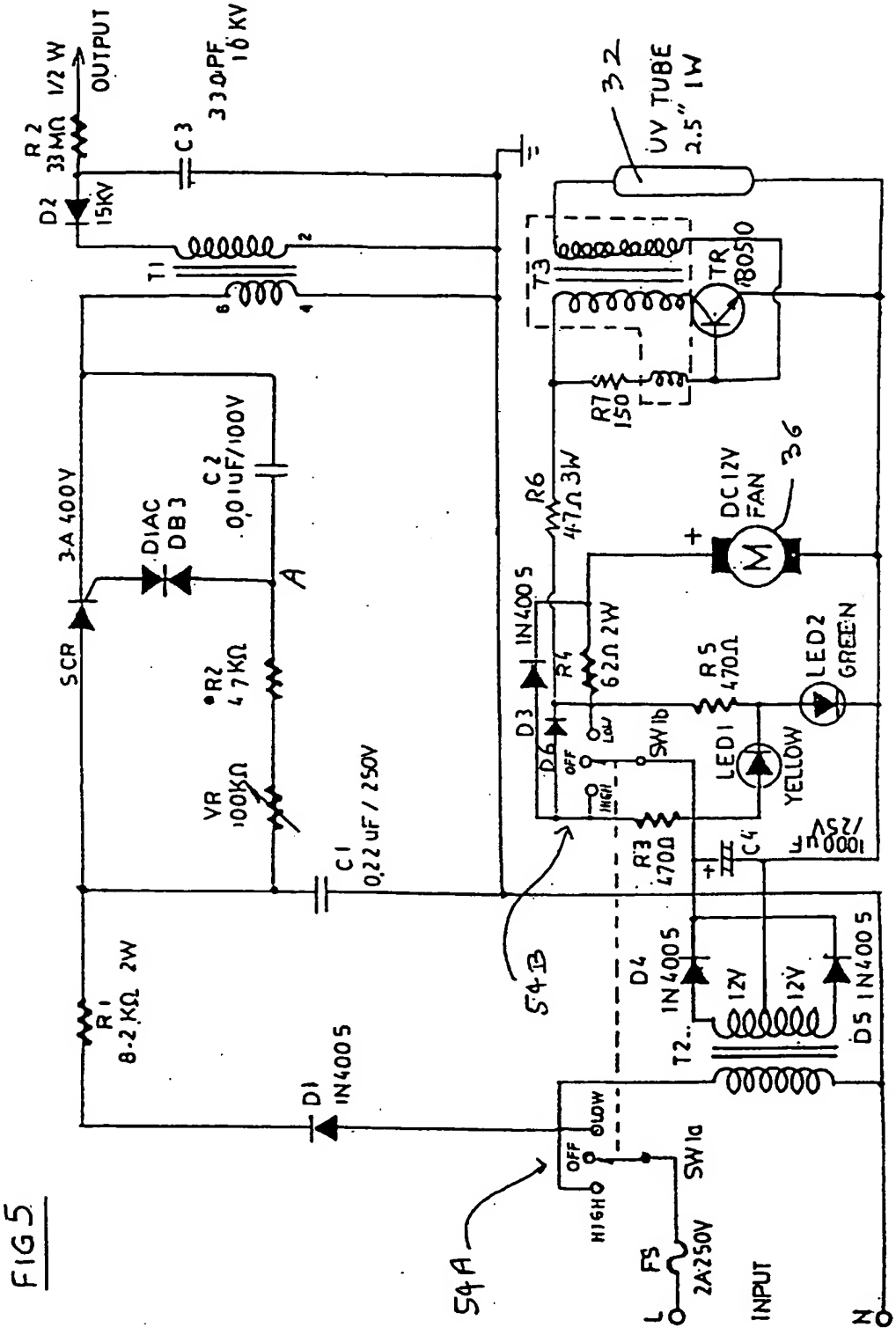

R2 33MΩ 1/2 W
OUTPUT
C3 330PF 16 KV
D2 15KV
T1
32 UV TUBE 2.5" 1W
T3
TR 18050
R7 150
R6 47Ω 3W
DC12V FAN
36
3A 400V
DIAC DB3
C2 0.01UF/100V
A
SCR
IN4005
R4 62Ω 2W
R5 470Ω
LED2 GREEN
D3
D6
OFF
LOW
HIGH
SW1b
LED1 YELLOW
*R2 47KΩ
VR 100KΩ
C1 0.22 uF / 250V
R3 470Ω
C4
1000/25V
S4B
D4 IN4005
D5 IN4005
12V
12V
T2
R1 8.2KΩ 2W
D1 IN4005
OFF
LOW
HIGH
SW1a
S4A
F3 2A 250V
L
INPUT
N

FIG 5

FIG. 6

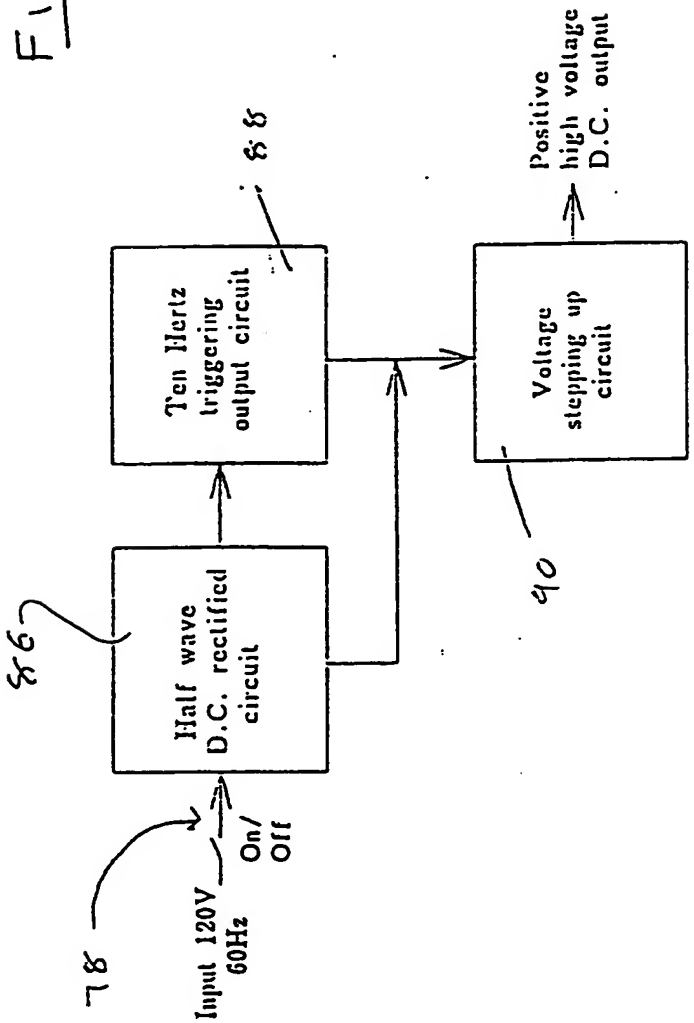
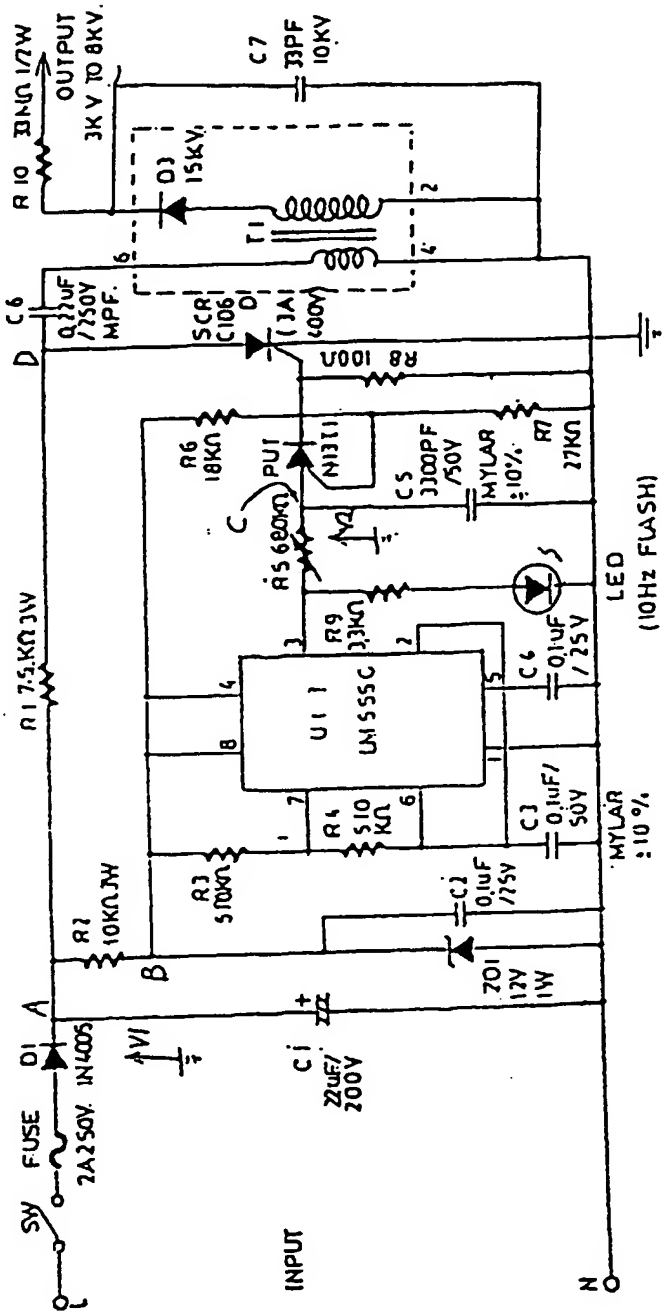

Positive high voltage D.C. output
86
Ten Hertz triggering output circuit
Half wave D.C. rectified circuit
Voltage stepping up circuit
On/ Off
Input 120V 60Hz
78
90

FIG. 7


R10 33KΩ 1/2W
OUTPUT
3K V TO 8KV.
C7
33PF
10KV
D3
15KV,
T1
C6
0.22uF
/250V
MPF.
SCR
C106
D
(1A)
400V
R8 100Ω
R6
18KΩ
PU1
N1311
C5
3300PF
/50V
MYLAR
±10%
R7
27KΩ
C
R5 680KΩ
R9
33KΩ
LED
(10Hz FLASH)
R1 7.5KΩ 3W
U11
UN555C
C4
0.1uF
/25V
R4
510
KΩ
C3
0.1uF/
50V
MYLAR
±10%
R3
510KΩ
C2
0.1uF
/75V
R2
10KΩ 1W
ZD1
12V
1W
D1
IN4005
AV1
C1
22uF/
200V
SW
FUSE
2A 250V
INPUT
L
N

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AIR PURIFYING DEVICE

This invention relates to an air purifying device.

It is believed that in the indoor environment of a house or office the occupants are shielded from certain naturally occurring beneficial electric fields which exist near the earth's surface at a potential of 50 to 750 volts per metre. This phenomenon is known as the Faraday Cage Effect. It is also believed that in an indoor environment the occupants are shielded from a certain pulsed resonance within the aforesaid electric fields, such resonance being known as the Schumann Resonance. Such pulsating fields having a frequency typically in the range of 7 Hz to 32 Hz, and more particularly in the range of 7 Hz to 10 Hz, are believed to have beneficial effects on humans. It is also believed that such indoor environments become ion depleted and are susceptible to accumulation of gases and particulate pollutants.

It has also been suggested that the provision of negative ions in the atmosphere of an indoor environment may stimulate biochemical reactions and/or increase the metabolic rate of breathing such ions, and may also reduce production of the hormone serotonin which is believed to be associated with depression and fatigue.

It is an object of the present invention to provide a new and improved air purifying device.

In accordance with the broadest aspect of the invention there is provided an electrically powered air purifying device comprising an ionizer unit having a negative high voltage direct current ionizing element over which, in use, air is passed by an electrically operated fan, and an ultra-violet emitter over which, in use, incoming air is passed by said fan prior to being passed over said ionizing element; and a dust collector unit having a positive high voltage direct current element to which, in use, negatively ionized particles in the atmosphere are attracted.

Conveniently the ionizer unit comprises a body having a first face providing an air inlet and a second face providing an air outlet, said ionizing element being mounted internally of said body adjacent said air outlet, said ultra-violet emitter being mounted internally of said body adjacent said air inlet, and said fan being mounted internally of said body to draw air through said air inlet passed said ultra-violet emitter and said ionizing element, and to blow ionized air out of said air outlet.

Said body may be of pyramidal form and said first and second faces thereof may conveniently comprise planar faces opposite to one another.

Conveniently the dust collector unit comprises a body having a face providing a mounting for an electrically conductive foam material in electrical contact with an electrically conductive ribbon element comprising said positive high voltage direct current element.

The said body of the dust collector unit may also be of pyramidal form with said face thereof comprising a planar face.

Other features of the invention will become apparent from the following description given herein solely by way of example with reference to the accompanying drawings wherein:-

Figure 1 is a somewhat diagrammatic perspective view of an air purifying device comprises an ionizer unit and a dust collector unit.

Figure 2 is an exploded perspective view of the ionizer unit of Figure 1.

Figure 3 is an exploded perspective view of the dust collector unit of Figure 1.

Figure 4 is a block diagram of a drive circuit for the ionizer unit.

Figure 5 is a circuit diagram of the ionizer unit.

Figure 6 is a block diagram of a drive circuit for the dust collector unit.

Figure 7 is a circuit diagram of the dust collector unit.

As illustrated in Figure 1 of the drawings an air purifying device comprises an ionizer unit 10 and a dust collector unit 12. Each of said units 10 and 12 comprises a pyramidal body wherein the ionizer unit 10 includes an air outlet grill 14 in one planar face 16 of the body for the emission of ionized air there through, and the dust collector unit 12 includes an electrically conductive foam 18 on one planar face 20 of the body for the attraction of dust particles thereto.

The construction of the ionizer unit 10 is shown in more detail in Figure 2 as having a base 22 of generally square configuration and a pyramidal cover 24 having four planar faces together defining the said pyramidal body. Said face 16 is provided with the grill 14 whilst an opposed face provides an air inlet comprising a filter holder 26, a foam filter 28, and a filter cover 30. Within the body adjacent the filter holder 26 there is provided an ultra-violet emitter in the form of a UV tube 32.

Within the body adjacent the air outlet 14 there is provided a fan cover 34, an electrically powered fan 36 and a support frame 38 therefor. A carbon fibre element 40 is mounted adjacent the grill 14 to provide a negative high voltage direct current ionizing element as will be further described herein.

The base 22 of the ionizer unit provides fittings for a printed circuit board 42, transformers 44 and power cord 46 as further described herein with reference to Figures 4 and 5.

A third face 48 of the cover 24 provides an aperture 50 for mounting an on/off switch 52 for energising the fan 36, the UV tube 32 and the negative high voltage direct current output to the carbon fibre element 40. Different colour light emitting diodes are receivable in apertures 54 provided in the face 16.

In operation, when the ionizer unit is switched on, the fan 36 draws air from the atmosphere into the unit through the foam filter 28, over the UV tube 32, over the negative high voltage carbon fibre element 40 and blows ionized air out of the unit through the air outlet grill 14. The UV tube 32 functions to partially ionize incoming air which is then further ionized by being drawn over the negative high voltage direct current carbon fibre element 40.

Referring to the ionizer unit circuits, in Figure 4 electric power, conveniently at 120 volts and 60 Hz, is supplied through the switch 52 to a triggering circuit 56 and a voltage stepping-up circuit 58 which provides a negative high voltage direct current output. The electrical power is also supplied to a full wave rectifier circuit 60 for supplying power to the electrically driven fan 36 through a speed controller 62 and to the ultra-violet emitter 32 through DC to AC converting circuit 63.

Referring to Figure 5, the switch 52 has a first set of contacts 54A and a second set of contacts 54B in tandem. When either of contacts 54A is closed power is supplied via a diode D1 to charge up capacitors C1 and C2 via resistors R1 and variable resistor VR and R2, respectively, connected to a primary winding of a transformer T1. When the voltage at A reaches the breakdown voltage of a bidirectional triggering diode DIAC DB3 it turns ON a silicon controlled rectifier SCR. As a result capacitor C2 starts to discharge through DIAC DB3 and capacitor C1 discharges through the silicon controller rectifier SCR and the primary winding. A voltage is developed on a secondary winding of the transformer T1 and is supplied via a resistor R2 and a capacitor C3 to an output terminal. A blocking diode D2 ensures that the output voltage has a negative polarity.

The DIAC DB3 and silicon controlled rectifier SCR both turn OFF when the voltage at A decreases to a value equal to the sum of the breakdown voltage of the DIAC and the silicon controlled diode SCR. The capacitors C1 and C2 will then charge up again and when the voltage at A rises above the breakdown voltage of the DIAC DB3, the turn ON and OFF cycle will begin again. Such cycles occur many times within each voltage cycle of the supply voltage.

The value of the output voltage can be altered by adjusting the resistor VR.

The contacts 54B are used to supply a DC voltage which comes from a full wave rectifier circuit comprising a transformer T2, diodes D4 and D5 and a smoothing capacitor C4 to drive a motor for the fan 36. In one position of the switch contacts 54B, two resistors R4 and R5 are included in the circuit and in another position one resistor R3 is included to provide a low and high speed operation of the fan motor, respectively. At low speed, a (green) light emitting diode LED2 is illuminated, and at high speed the diode LED2 and a (yellow) light emitting diode LED1 are illuminated.

Through transformer T3 the UV emitter 32 is energised whenever contacts 54A and 54B are in either of their "high" or "low" positions.

It is believed that the negative ions generated by the ionizer unit may stimulate bio-chemical reactions in humans and may also reduce production of the hormone serotonin which is believed to be associated with depression and fatigue.

The dust collector unit 12 shown in Figure 3 comprises a base 64 of generally square configuration and a pyramidal cover 66 having four planar faces together defining the said pyramidal body. The face 20 of the cover includes a foam holder 68 for the electrically conductive foam 18 mounted on said face 20 in electrical contact with an electrically conductive ribbon element 70 supplied with a positive high voltage direct current as further described below. Said face 20 of the collector unit includes an aperture 72 for a light emitting diode whilst another face 74 of the unit includes an aperture 76 for the mounting of an on/off switch 78. The base 64 of the unit provides fittings for a printed circuit board 80, transformer 82 and power cord 84 as described in more detail herein with reference to Figures 6 and 7.

Referring further to the dust collector unit circuits, in Figure 6 a half wave rectifier 86 is supplied with electrical power conveniently at 120 volts and 60 Hz, via the switch 78. Separate outputs of the rectifier 86 are supplied directly and via a triggering circuit 88 to a voltage stepping-up circuit 90 which produces positive high

voltage direct current at its output. The combinations of the signals at the input to the circuit 90 enables the frequency of its output to be substantially higher than that of the power supply frequency.

Referring to Figure 7, a diode D1 and capacitor C1 form the half wave rectifier 86 (of Figure 6). A voltage regulating circuit, consisting of resistors R3 and R4, controls the voltage at point B to be 12 volts maximum.

The output of the half wave rectifier is supplied directly to a primary winding of a stepping-up transformer T1 via a resistor R6 and a capacitor C6. The output of the half wave rectifier is also supplied to the 10 Hz triggering circuit 88 (of Figure 6) which includes an integrated circuit U1, a PUT (programmable unijunction transistor), and a silicon controlled rectifier SCR.

The integrated circuit is supplied via resistors R3 and R4 and produces a square wave output at approximately 10 Hz. The output is supplied to a light emitting diode LED and to a charging circuit formed by a variable resistor R5 and a capacitor C5. When the voltage at C is greater than the gate voltage of the PUT (determined by resistors R6, R7 and R8), the PUT will turn ON. As a result, the voltage across the capacitor C5 will trigger the SCR to turn ON. The capacitor C5 then discharges via the PUT through the resistor R8 until the discharge current is smaller than the

holding current for the PUT when the PUT will turn OFF. As a consequence the SCR will be turned OFF. Capacitor C5 then charges up again until its voltage is greater than the gate voltage of the PUT and the cycle starts again. Thus, the SCR is turned ON and OFF many times during each square wave of the output of the integrated circuit U1.

This triggering of the SCR is imposed on the voltage supplied to the primary winding of the transformer T1. At the beginning of each cycle the voltage at D1 is initially at zero volts and rises as a capacitor C6 charges up and whenever the SCR is ON the capacitor C6 discharges through the primary winding. The secondary winding of the transformer T1 supplies a positive high voltage direct current to an output terminal via a diode D3, resistor R10 and a capacitor C7. The output voltage can be altered by adjusting resistors R1 or R5.

The pulsating fields generated by the dust collector are believed to exert positive effects on humans, particularly in the reduction of stress.

Thus, in use, the ionizer unit may be utilized to provide a supply of negative ions into the atmosphere under low or high speed fan conditions whilst the dust collector unit may be activated to provide a pulsating positive high voltage to attract negatively charged dust particles onto its electrically conductive foam. Typically, the two units

may be separated from one another by some 1.5 metres to 2.5 metres and may be utilised to treat a room having a floor area of around 18.5 sq. metres.

CLAIMS:-

1. An electrically powered air purifying device comprising an ionizer unit having a negative high voltage direct current ionizing element over which, in use, air is passed by an electrically operated fan, and an ultra-violet emitter over which, in use, incoming air is passed by said fan prior to being passed over said ionizing element; and an air purifying device including a dust collector unit having a positive high voltage direct current element to which, in use, negatively ionized particles in the atmosphere are attracted.

2. An air purifying device as claimed in Claim 1 wherein the ionizer unit comprises a body having a first face providing an air inlet and a second face providing an air outlet, said ionizing element being mounted internally of said body adjacent said air outlet, said ultra-violet emitter being mounted internally of said body adjacent said air inlet, and said fan being mounted internally of said body to draw air through said air inlet passed said ultra-violet emitter and said ionizing element, and to blow ionized air out of said air outlet.

3. An air purifying device as claimed in either one of Claims 1 or 2 wherein the dust collector unit comprises a body having a face providing a mounting for an electrically conductive foam material in electrical contact with an

electrically conductive ribbon element comprising said positive high voltage direct current element.

4. An air purifying device as claimed in Claim 2 wherein the body of the ionizer unit is of pyramidal form and said first and second faces thereof comprise planar faces.

5. An air purifying device as claimed in Claim 4 wherein said first and second faces are opposite to one another.

6. An air purifying device as claimed in Claim 3 wherein the body of the dust collector unit is of pyramidal form and said face thereof comprises a planar face.

7. An air purifying device constructed and arranged substantially as hereinbefore described.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	Application number GB 9510190.3
Relevant Technical Fields (i) UK Cl (Ed.N) F4A: XFC (ii) Int Cl (Ed.6) F24F	Search Examiner MR G WERRETT Date of completion of Search 29 AUGUST 1995
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASIS: WPI	Documents considered relevant following a search in respect of Claims :- 1 TO 7

Categories of documents

X:	Document indicating lack of novelty or of inventive step.	P:	Document published on or after the declared priority date but before the filing date of the present application.
Y:	Document indicating lack of inventive step if combined with one or more other documents of the same category.	E:	Patent document published on or after, but with priority date earlier than, the filing date of the present application.
A:	Document indicating technological background and/or state of the art.	&:	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2036951 A	(SCHMIDT-REUTER) see Figures 1 to 3	1
X	GB 2021757 A	(NISSAN) see page 2, line 33 on	1

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